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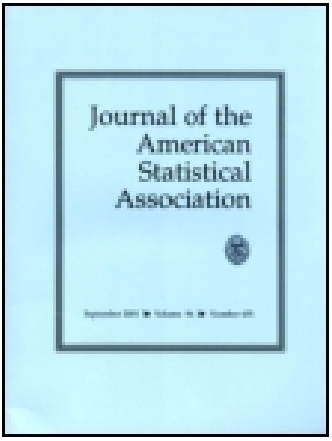

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Statistical Measurement and Economic Mobilization Planning

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STATISTICAL MEASUREMENT AND ECONOMIC MOBILIZATION PLANNING*

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ADEQUATE information on resources-requirements balance sheets is indispensable for top policy decision and its administration, both in peace and in war. Compilation of detailed balance sheets for use in mobilization is a great statistical undertaking. The purpose of this paper is to outline the kinds of data and methods used in mobilization planning, for the information of the statistician who suddenly finds himself thrown into some part of the job.

PEACETIME PLANNING

In peacetime when the country is carrying out what used to be thought of as "normal defense effort," the military is nevertheless attempting to anticipate the problems of wartime. At such times, the problem is one of determining whether or not the strategic plans of the Joint Chiefs of Staff are within the country's economic potential. To make such an evaluation, requirements for key resources such as manpower, steel, copper, aluminum, and lumber must be calculated and measured against potential supplies. This appraisal is made by using relatively crude techniques, without going into detailed type, size, shape, and form breakdowns.

In the case of military requirements the task is handled by the Munitions Board working with the three Services; in the case of non-military requirements, by regular agencies of government. Common assumptions are supplied to the several agencies by the National Security Resources Board and the results integrated and appraised by that agency.

PARTIAL MOBILIZATION

In a period of partial mobilization such as the present, to assure that military and essential civilian production can obtain required resources when needed the government interferes with the normal functioning of the economic system. It must then make decisions regarding the extent to which industrial expansion should be encouraged and facilitated, the cuts to be made in scarce materials allowed for making civilian consumer products, the kinds of goods which should be pro-

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** Formerly NSRB—now Defense Production Administration.

duced in larger or in smaller quantities. Other decisions must be made regarding how production and distribution are to be altered with a minimum of government control, preferably indirect control.

As the degree of partial mobilization grows, techniques used in wartime must be substituted. Peacetime "resources-requirements analysis" must be expanded to provide basic information for new policy decisions. Military requirements are calculated in greater detail. Analysis of government statistical records and trade association compilations is intensified.

WARTIME OPERATION

In wartime important resources such as steel, are allotted among specific programmed uses. However, such an allotment cannot be made in terms of steel, but steel of a specific shape, form, size, and composition, and in just the right quantity to meet a definite production schedule. To do this job, detailed records of industry must be used in place of general overall figures. This necessitates detailed calculations of needs by sub-contractors, which are passed on to prime contractors, consolidated and passed on to government as firm requirements. In government, all of the requirements for steel in all of its detail must be aggregated by specific programs, such as the several munitions categories, industrial expansion, foreign aid, mining, agriculture, etc., and then consolidated into overall totals.

When this is done and the totals are measured against the prospective supply, decisions must be made as to what programs are to be curtailed, and by how much.

BALANCE SHEET COMPARISONS

The adequacy or inadequacy of resources to meet requirements can be presented in a form currently termed "balance sheets". These can also show the adjustments necessary to bring supply and demand into balance.

For the composite programs, military and non-military, dollars and manpower are the only common units of measurement that can be used. For the production of specific goods, measurements are needed also in terms of materials, facilities, fuels, and electric power. In World War II, it was found that overall munitions programs could be analyzed effectively in terms of steel, copper, and aluminum. For some particular programs, tests of adequacy of resources had to be made in terms of plant capacity, or supplies of key components, at least over a short period; for others, in terms of rubber, or lumber, or some other less generally used material.

ROUGH MEASUREMENT OF RESOURCES AND REQUIREMENTS PRIOR TO ACTUAL MOBILIZATION

Detailed measurement of requirements and resources, covering thousands of types of goods and services and expressed both in dollars and in amounts of needed materials and other resources, is an expensive, elaborate process, and not necessary until supplies are expected to become critically short.

For long-run policy decisions of mobilization planning—and even, to some extent, wartime operations—military programs and the related industrial programs should be handled as approximations prepared within a reasonably short period of time. Only in this way can military strategy and the related operational programs be evaluated in terms of what is economically and humanly possible, and promptly readjusted to changing military and resources situations.

Rough or aggregate balance sheets can be developed in two supplementary ways: (1) in terms of a summary Gross National Product analysis, and (2) in terms of a rough programming of needs for key resources.

1. One may prepare a summary tabulation in dollar terms of the current output of goods and services and then see if production can be enlarged and readjusted to meet the proposed military requirements. Account must be taken of construction required during the period and the goods and services to be made available to the consumer-civilian economy. Capacity must be figured in terms of manpower, materials, and facilities which can be counted on during an anticipated mobilization period. This is a very useful tool to show rather promptly the limitations on mobilization programs in terms of the job the economy can do and the amount of shifting over to the production of war goods which is required. It may also be used to show the impact of mobilization programs on production of consumers' goods and the inflationary pressures created.
2. This general study must be supplemented by a series of balance sheets, one for each of the key resources which may limit overall programs. Then it can be shown what detailed adjustments are needed to bring about a balance. This "programming" of the uses of a material can be done in terms of physical units, with or without analysis of special types and shapes. A rough summary presentation is adepuate for many policy problems.

The problem of translating estimated end products requirements into basic materials and other resources needs can be attacked by using rough historical relationships. World War II data on the average metal content per million dollars of major categories of military products are helpful in estimating the burden of proposed military programs on key materials. There are, however, two difficulties. In cases of substantial changes in the design of military products the metal content must be recomputed. Also, adjustments have to be made to reflect price changes since World War II.

MORE DETAILED CALCULATION OF RESOURCES AND REQUIREMENTS IN TIME OF MOBILIZATION

The two frameworks of analysis just described are also used in formulating the balance sheets for use in mobilization or wartime, except that they are expanded to allow for greater detail. The Gross National Product analysis can be greatly enlarged, notably in the military categories. Programming can be carried out in terms of specific uses and for specialized types and shapes of the needed materials. The latter process may become "scheduling," with the aim of directing particular quantities of resources to specific uses. The necessary statistical operation becomes complex; rough approximations are no longer adequate. Even so, measurement is still a process of statistical estimating.

At first, analyses must be based on data already available. But as soon as possible additional data must be collected from industry and the military procurement groups. The government agency responsible for the balance sheet compilation lays down rules concerning the units of measure, time periods, program classification and resources to be surveyed. Figures from industry are needed for the calculation of both supplies and requirements. Only industry can furnish certain facts about capacities and even foreign supplies. On the requirements side, no one knows more accurately than industry what resources are needed to produce specific items.

To determine materials requirements in the detail needed for wartime programming and schedule, two techniques are used: (1) bills of materials;[1] and (2) experience ratios.

1. Where the amounts of materials that enter into a product are well-known, bills of materials are extensively used, for major military products as well as for many civilian products. Where accurate bills of materials exist, requirements calculations of end products in terms of raw material needs are quite satisfactory. Bills of material change frequently, however, and always need to be re-examined. In some cases where bills of materials are not available for particular products, notably for civilian-type products, average resource usage is computed for more or less homogeneous groups of end products. Input-output studies have used this type of data. High-speed electronic calculators make it possible in a short period of time to aggregate the materials, parts, and labor needed to produce a large number of items in a series of military and civilian programs. The technique cannot yet be applied generally to current programs, since the use-ratios or coefficients

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[1] A bill of materials states the amount of materials required to make one unit of a product.

for many groups of manufactured products are still in process of development.

Prototype bills of material are also used. Where a category of munitions is composed of a large number of reasonably homogeneous items, it is sometimes possible to estimate fairly accurately the material requirements by taking the item most typical of the group and computing the material needs on that basis.

2. World War II data on the relationship between the raw materials put into a plant producing an item, and the outflow of finished products, can be used in requirements estimating. During World War II it was found that these "experience ratios" remained stable enough so that they constituted a reasonably satisfactory working rule for estimating the quantities of materials, parts, and supplies to be allocated to particular programs. But the ratios did vary. The problem is to revise the ratios in the light of changes in design and content of products so as to make them applicable to future allocations or programming periods. Thus, bills of materials and experience ratios are used in conjunction.

ADEQUACY OF STATISTICAL DATA

In peacetime, the Government has neither the authority nor the staff to collect and analyze detailed figures of individual establishments.

Government statistics collected and in large part published in peacetime are weak in the very areas which are of critical importance to mobilization. Information is needed particularly on production capacity for key components, and on current uses of production capacities, on metals consumption by products, both munition and civilian types, and on inventories of raw, semi-finished, and finished metals and products. Also, information must be assembled on prices for components, equipment, and finished products, notably munitions items. In fact, the analyst and the administrator need details about all aspects of the productive process.

They have at their disposal the vast collection of World War II data, but many problems arise in using this information. First, there is the basic point that many types of products—planes, guns, and tanks—have changed so that the World War II data are not applicable or must be considerably adjusted. Then there is a classification problem. Data of the World War II War Production Board are tangled because of the many systems of classification employed. These were the original Census commodity codes, the several product codes used in operating the Production Requirements Plan, the Controlled Materials Plan code, and the so-called "B" product listing. It is hard to compare data because the item categories change from list to list and from year to year.

Recently, efforts have been made to remedy some of these statistical difficulties. Steps have been taken to close gaps in the development of capacity information and data related to the input-output system. The National Production Authority and other defense agencies have inaugurated a series of plant operations reports which will yield valuable information on current materials consumption by plants.

MAJOR TECHNICAL PROBLEM AREAS

Attention may be called to a few problems in balance sheet analysis.

Circularity of Requirements.—One difficulty is the circularity of requirements; that is, the interdependence of requirements as among industries and between requirements and supply. Consider the drafting of a man into the Army. Military requirements are increased, civilian requirements decreased, the civilian labor force, and therefore the capacity of the nation to produce goods and services, is decreased. Another illustration is that coal production requires steel and transportation; transportation requires steel and coal; and steel production requires coal and transportation.

One way to break into this circle is through the use of assumptions worked into an inter-industry relations analysis or a Gross National Product projection. The structure of the GNP is based upon the stated size of the labor force, estimates of productivity, and assumed number of hours worked. It also reflects certain basic strategic and military assumptions as to the character, timing, and duration of mobilization, and other assumptions as to the derived demand for transportation and transportation equipment, electric power and generating equipment, general purpose industrial equipment, and so forth.

Within this Gross National Product total are included estimates of the major classes of expenditures for consumer durables, non-durables, and services; for investment; and for government. These estimates are made consistent with stated general objectives with regard to the expansion of capacity. Most important for the purpose at hand are the estimates of the size of the military effort and of the degree to which civilian consumption may be limited by shortages in steel, plant capacity, or other limiting factors.

In the GNP-assumptions technique, we must be cautious lest the results be predetermined by the assumptions. We must always be alert in reviewing calculations submitted to us and assure ourselves that the estimates represent independent judgments and are not mere arithmetical projections of the assumptions.

Flexibility in the Estimating System.—Mobilization planning must be flexible. It must permit the consideration and weighing of alternatives, so that the responsible government officials can evaluate the impact of proposed and alternative policies. Unfortunately, requirements estimating is rather time-consuming and relatively rigid in its application. This is particularly true of military requirements. At the present time it takes many months to translate a strategic plan into a full set of military requirements and to test those requirements. The result is that if calculations are needed within a shorter period, the services merely adjust previously calculated requirements in an attempt to allow for changed assumptions, time periods, and conditions.

On the civilian side, the government agencies have used more flexible techniques which permit rapid calculation and the consideration of alternatives. The price for this, of course, is substantially less detail in the calculations. For programming purposes, however, the information is adequate.

This time and flexibility problem exists in much less degree for the detailed balance sheet program instituted in actual mobilization. It takes a long period of time to develop processes to the point where quick periodic balance sheets are prepared. But once the mechanism is perfected, data to cover short time periods can be produced with remarkable speed. Moreover, the existence of the procedure for the detailed balance sheet will aid in perfecting the acuracy of the long-range balance sheet and permit quicker calculations.

Civilian Consumer Requirements.—In developing estimates of civilian requirements there is much need for improvement. To date, we have been forced to rely to a large extent upon World War II experience, taking per capita consumption at the 1943 or 1944 level, adjusted for population increase and changes in the character of the economy since the war, and on calculations by the War Production Board's Office of Civilian Supply of certain minimum standards of civilian consumption. The great utility of the 1944 level is that we know approximately what it involved in the way of a rationing policy, administrative difficulties, and consumer resistance. The problems of applying these standards to balance sheet calculations, however, are formidable. We have, therefore, been forced to view the civilian requirements as, in effect, residual, and then try to appraise the effect on the economy of the curtailments indicated. This is inadequate.

World War II experience will not resolve this problem. It was never satisfactorily met in World War II, perhaps because we didn't need to meet it. Techniques remain to be developed.

Regional Information.—In large part, the statistical analyses which have been used for mobilization planning deal with national totals. But for manpower and electric power, regional information is vital. There is a wealth of information on the supply aspects of labor and power market areas; but we have been able to do little on regional requirements. Little is known of the geographic pattern of prime contract awards or of sub-contracting. We may know that manpower will be in short supply nationally, and yet not know where there may be local surpluses which could conceivably be transferred to other regions or whose participation could be obtained by placing contracts in those areas.

Both manpower and electric power are likely soon to be in sufficiently short supply in certain regions to call for direction of additional defense work elsewhere. Special surveys may have to cover the local uses of these resources as a guide to what can be shifted or curtailed. In wartime, of course, more adequate regional and area data can be collected, and the present gaps partially filled. There will probably still be a need, however, to develop better techniques for measuring the impact of national programs upon regions and areas.

Coordinating Data.—Coordination between the individual balance sheets for basic material, manpower, transportation, and electric power, with their varying units of measure, is difficult. Some progress has been made in integrating balance sheets for different resources; yet much more needs to be done. The problem is partly one of data.

CONCLUDING REMARKS

Much developmental work was done in the early stages of World War II. Increasingly, the trend has been to duplicate, with some modifications, the techniques, report forms, and operating procedures that finally evolved in 1944; and also, though this is a temporary expedient, to use 1944 data to a considerable extent. This is not to say that 1944 methods were perfect, or in particular that they were exactly suited to a situation of partial mobilization. But there is natural reluctance to abandon a system that was proved to be workable. Some improvements and adjustments are being made and others will follow. There is reasonable assurance that before very long the statistical support for an effective programming and allocation system will be available.